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IS 4931 (1995): Agricultural tractors - Rear mounted power take off Types 1, 2 and 3 [FAD 11: Agricultural Tractors and Power Tillers]



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IS 4931 : 1995

भारतीय मानक

कृषि ट्रैक्टर — पश्च-आरोपित पावर टेक-ऑफ-टाइप

1, 2 और 3

(तीसरा पुनरीक्षण)

Indian Standard

AGRICULTURAL TRACTORS — REAR
MOUNTED POWER TAKE OFF TYPES 1, 2 AND 3

(Third Revision)

ICS 65-060-10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1995

Price Group 5

**AMENDMENT NO. 1 AUGUST 2006
TO
IS 4931 : 1995 AGRICULTURAL TRACTORS —
REAR MOUNTED POWER TAKE OFF TYPES 1, 2 AND 3
(Third Revision)**

(Page 2, Fig. 1) — Substitute the value of diameter size of '*OPTIONAL HOLE*' as ' $\phi\ 8.3 \pm 0.1$ ' for ' $\phi\ 8.3$ '.

(Page 9, Table 6, Sl No. 3, col 7) — Substitute '89' for '289'.

(FAD 11)

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Agricultural Tractors and Power Tillers Sectional Committee had been approved by the Food and Agriculture Division Council.

This standard was first published in 1968 and subsequently revised in 1977 and 1984. After the revision of corresponding ISO standard a need was felt to revise it again to align the requirements with corresponding International standard. In this revision the tolerance on diameter of shaft profile of Type 1 PTO shaft, requirements of hardness, location of PTO and dimension of master shield are modified. Also safety requirements as per IS 12239 (Part 1) 1988 and alternate clearance zone has been included.

In the preparation of this standard assistance has been derived from ISO 500 1991 Agricultural tractor rear mounted PTO, Types 1, 2 and 3 issued by International Organization for Standardization

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AGRICULTURAL TRACTORS — REAR MOUNTED POWER TAKE OFF TYPES 1, 2 AND 3 (Third Revision)

1 SCOPE

This Indian Standard specifies requirements for Types 1, 2 and 3 rear-mounted power take-offs (PTO), the clearance zones around them and protection of the power take off on agricultural tractors.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard

IS No.	Title
1586 1988	Method for rockwell hardness test (Scales A-B-C-D-E-F-G-H-K) (<i>second revision</i>)
2102 (Part 1) 1980	General tolerance for dimension and form and position Part 1 General tolerance for linear and angular dimensions (<i>second revision</i>)
12239 (Part 1) 1988	Tractors and machinery for agriculture and forestry Technical means for ensuring safety Part 1 General requirements
12362 (Part 1) 1993	Technical requirements for towing connections of agricultural tractors : Part 1 Hook type (<i>first revision</i>)
12362 (Part 2) 1993	Technical requirements for towing connections of agricultural tractors Part 2 Clevis type
12362 (Part 3) 1994	Technical requirements for towing connections of agricultural tractors Part 3 Drawbar

3 TYPES OF POWER TAKE-OFF

3.1 The main characteristics of the three types of PTO shall be as specified in Table 1.

4 REQUIREMENTS AND SPECIFICATIONS

4.1 Manufacturing Requirements

4.1.1 The dimensions of the main PTO on agricultural tractors shall comply with Fig. 1, 2 or 3 and Tables 2, 3 or Table 4 as appropriate.

NOTE — Tolerance as per IS 2102 (Part 1) 1980 may be applied to various values

Table 1 Characteristics of PTO Types
(Clause 3.1)

PTO Type	Nominal Diameter mm	Number and Type of Splines	PTO Rated Rotational Frequency min ⁻¹
(1)	(2)	(3)	(4)
1	35	6 straight splines	540
2	35	21 involute splines	1 000
3	45	20 involute splines	1 000

4.1.2 To facilitate coupling, changes of shape at the end (for example, chamfering of splines) of the PTO Type 1 profile are admissible.

4.1.3 The hardened portion of the splines shall have a minimum hardness of 48 HRC when tested in accordance with IS 1586 : 1986.

4.2 Direction of Rotation

The PTO shall rotate clockwise when viewed from behind the tractor.

4.3 Location

On tractors with one PTO shaft, the location of the PTO axis shall lie within the shaded rectangle shown in Fig. 4 (see Table 5).

4.4 Clearance Zone

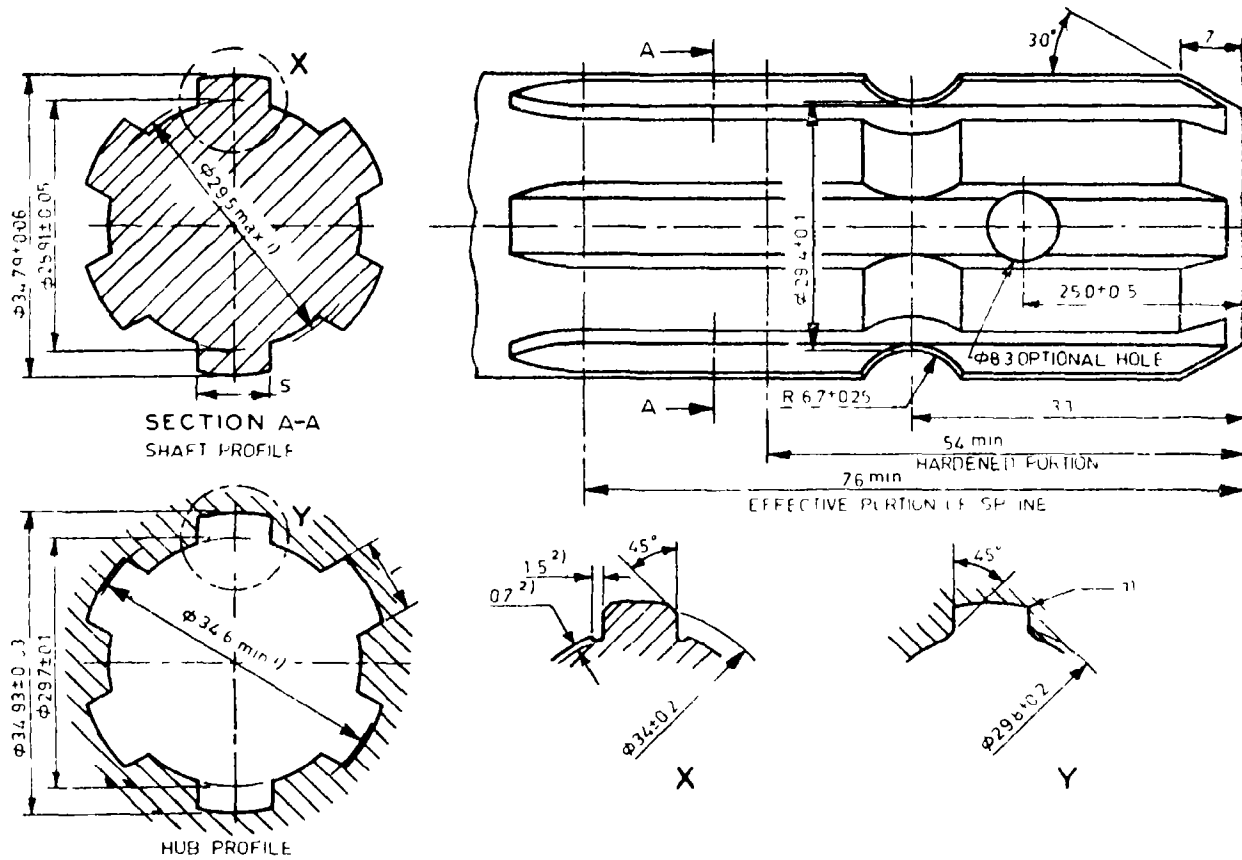
The clearance zone around the PTO shall be in accordance with Fig. 5 and Table 6.

NOTE — For a transition period, the clearance zone around the PTO shown in Fig. 6 is acceptable

4.5 Safety Related Requirements

4.5.1 The master shield, as shown in Fig. 7 and Table 7, shall be supplied by the manufacturer and shall be fixed to the tractor. It may also be hinged and/or be able to slide. If the same degree of safety is reached, equivalent protection devices (for example, towing hook or clevis supports) can be used instead of the master shield. In this case provision shall be made for anchoring the PTO drive-shaft guard.

4.5.2 Safety requirements given in IS 12239 (Part 1) 1993 shall also be met.



- 1) Form diameter
2) With or without tooth relief
3) Size of chamfer to be chosen by the manufacturer

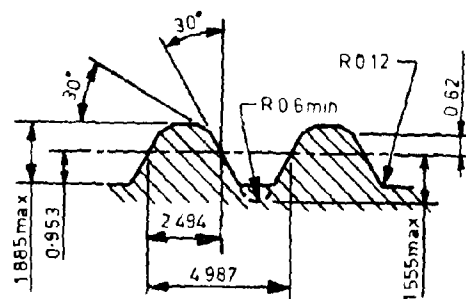
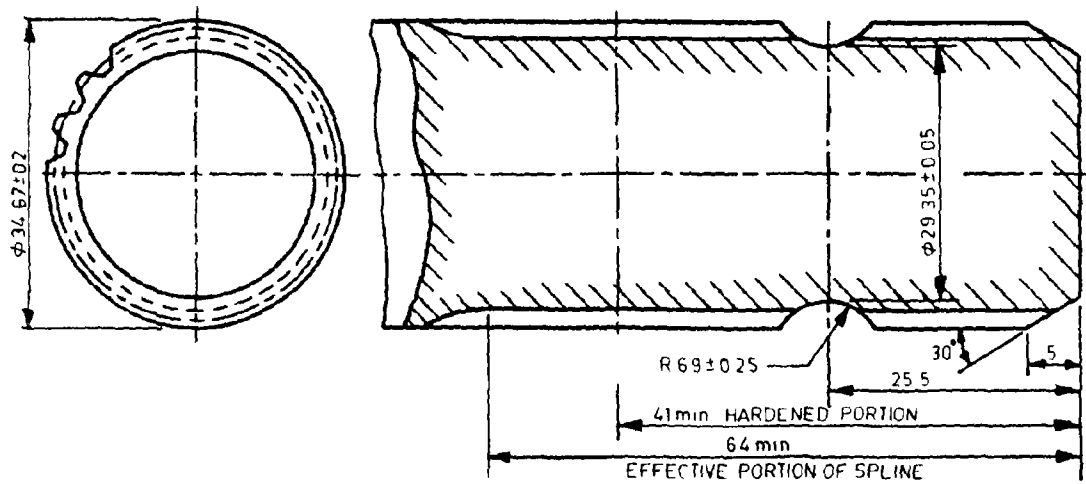
All dimensions in millimetres

FIG. 1 PTO TYPE 1

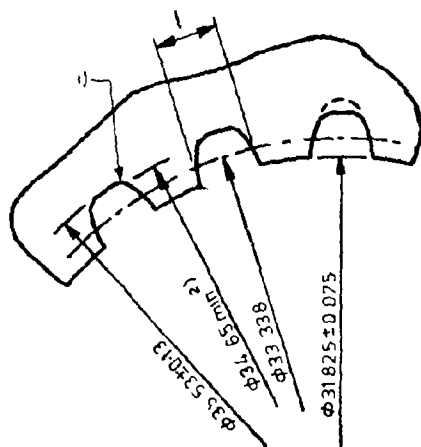
Table 2 PTO Type 1 Tolerances for Splines
(Clause 4.1.1)

All dimensions in millimeters

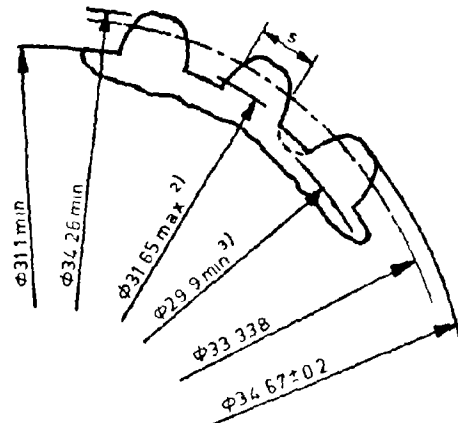
PTO Type 1	Hub	Shaft
Nominal dimension	1	s
	8 69	8 69
Test dimension	Individually measured 8 74 Max 8 71 Min	Individually measured 8 60 Max 8 53 Min
	GO' plug gauge 8 69 Min	'GO' ring gauge 8 64 Max



BASIC PROFILES OF SHAFT



HUB PROFILE



SHAFT PROFILE

Pressure angle $\alpha = 30^\circ$, number of teeth $z = 21$, module $m = 1.5875$ (diametral pitch 16)

1) Size of chamfer to be chosen by the manufacturer.

2) Form diameter

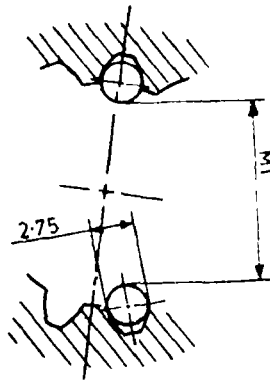
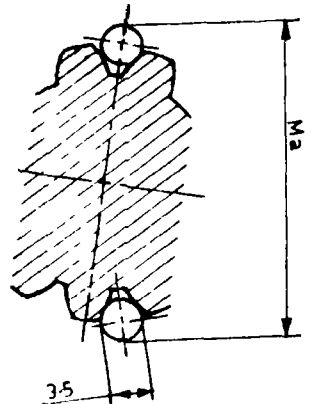
3) Only for tooth-based engaging system.

All dimensions in millimetres.

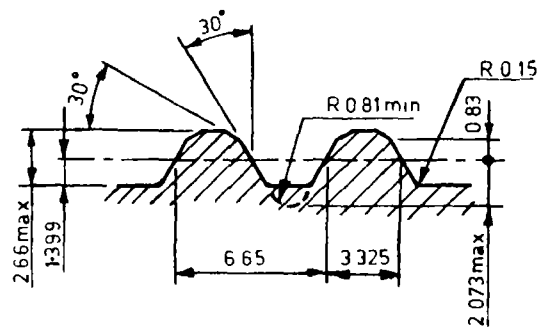
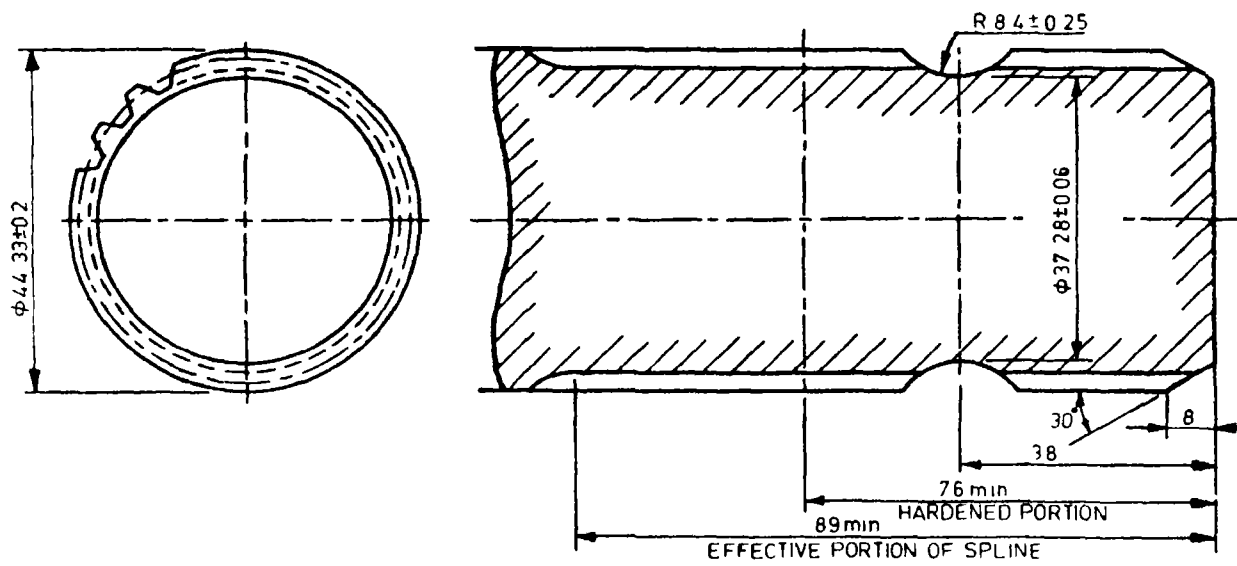
FIG. 2 PTO TYPE 2

Table 3 PTO Type 2, Tolerances and Change Factors for Splines
(Clause 4.1.1)

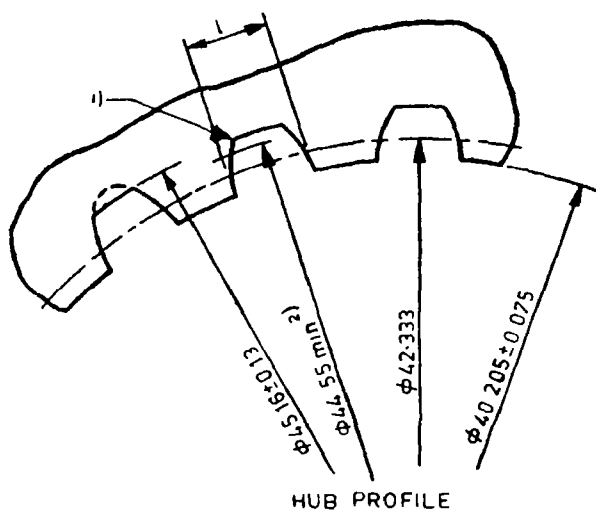
All dimensions in millimetres

PTO Type 2	Hub		Shaft	
Nominal dimension	1		s	
	2 494		2 494	
Test dimension	Individually measured	2 565 <i>Max</i> 2 520 <i>Min</i>	Individually measured	2 369 <i>Max</i> 2 306 <i>Min</i>
	With appropriate 'GO' plug gauge	2 494 <i>Min</i>	With appropriate 'GO' ring gauge	2 406 <i>Max</i>
Nominal dimension	Dimension between pins, M_1		Dimensions over pins, M_2	
	29 240		39 182	
Change factor ¹⁾	1 936		1 473	
Test dimension				
	29.38 <i>Max</i> 29.29 <i>Min</i>		39.00 <i>Max</i> 38.90 <i>Min</i>	

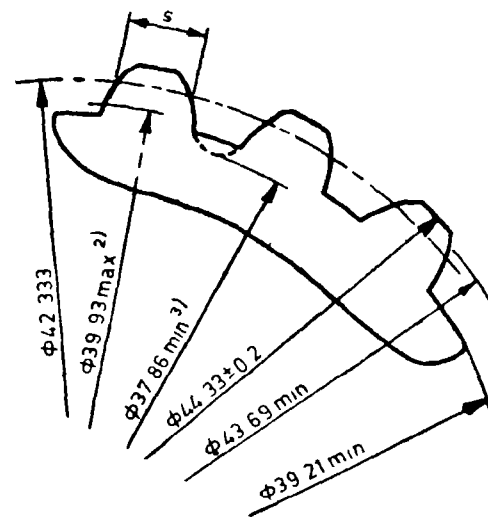
¹⁾ Change factors are taken from ANSI B92.1, *Involute splines and inspection*



BASIC PROFILES OF SHAFT



HUB PROFILE



SHAFT PROFILE

Pressure angle $\alpha = 30^\circ$, number of teeth $z = 20$, module $m = 2.1167$ (diametral pitch 12)

1) Size of chamfer to be chosen by the manufacturer

2) Form diameter

3) Only for tooth-based engaging system

All dimensions in millimetres.

FIG. 3 PTO TYPE 3

Table 4 PTO Type 3, Tolerances and Change Factors for Splines

(Clause 4.1.1)

All dimensions in millimeters

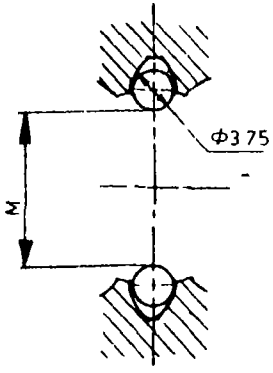
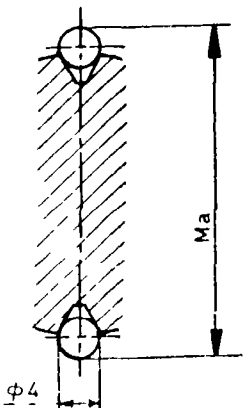
PTO Type 3	Hub		Shaft	
Nominal dimension	l		s	
	3 325		3 325	
Test dimension	Individually measured	3 396 <i>Max</i> 3 351 <i>Min</i>	Individually measured	3 200 <i>Max</i> 3 137 <i>Min</i>
	With appropriate 'GO' plug gauge	3 325 <i>Min</i>	With appropriate 'GO' ring gauge	3 237 <i>Max</i>
Nominal dimension	Dimension between pins, M_1		Dimensions over pins, M_a	
	36 704		48 432	
Change factor	2 0 16		1 544	
Test dimension				
	36 85 <i>Max</i> 36 75 <i>Min</i>		48 239 <i>Max</i> 48 142 <i>Min</i>	

Table 5 Location of PTO

(Clause 4.3)

All dimensions in millimetres

PTO Type	h ¹⁾	
	<i>Min</i>	<i>Max</i>
1	450 ²⁾	675
2	550	775
3	650	875

¹⁾ For the purpose of compatibility, it is recommended that the upper region of the location area be used²⁾ May be reduced to 350 mm on tractors with a minimum track setting of 1 150 mm or less

All dimensions in millimeters

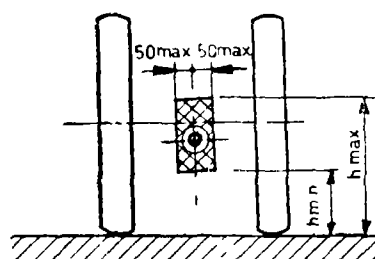
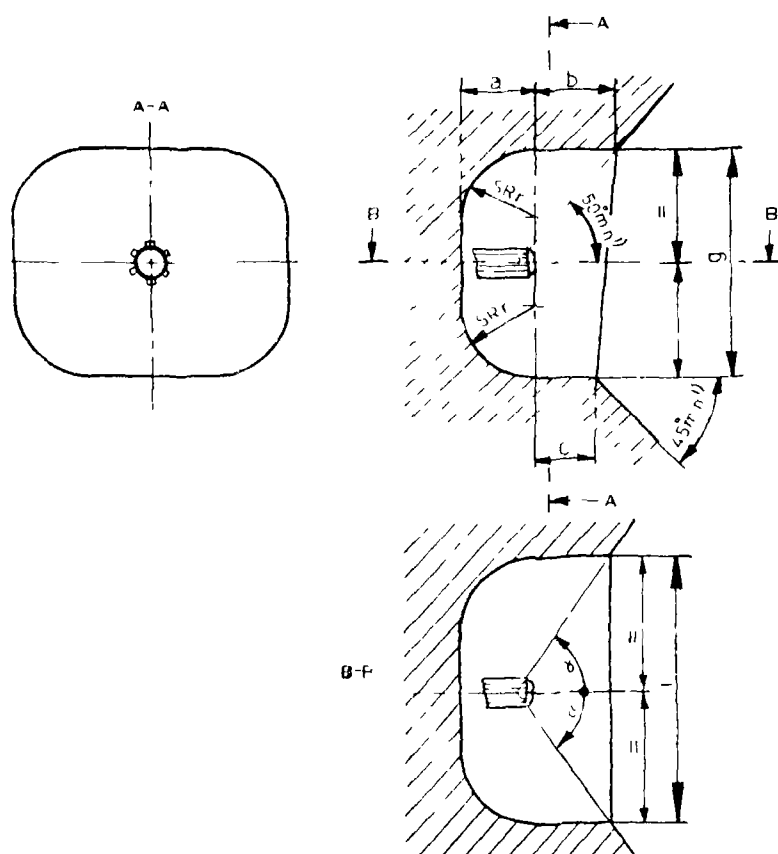
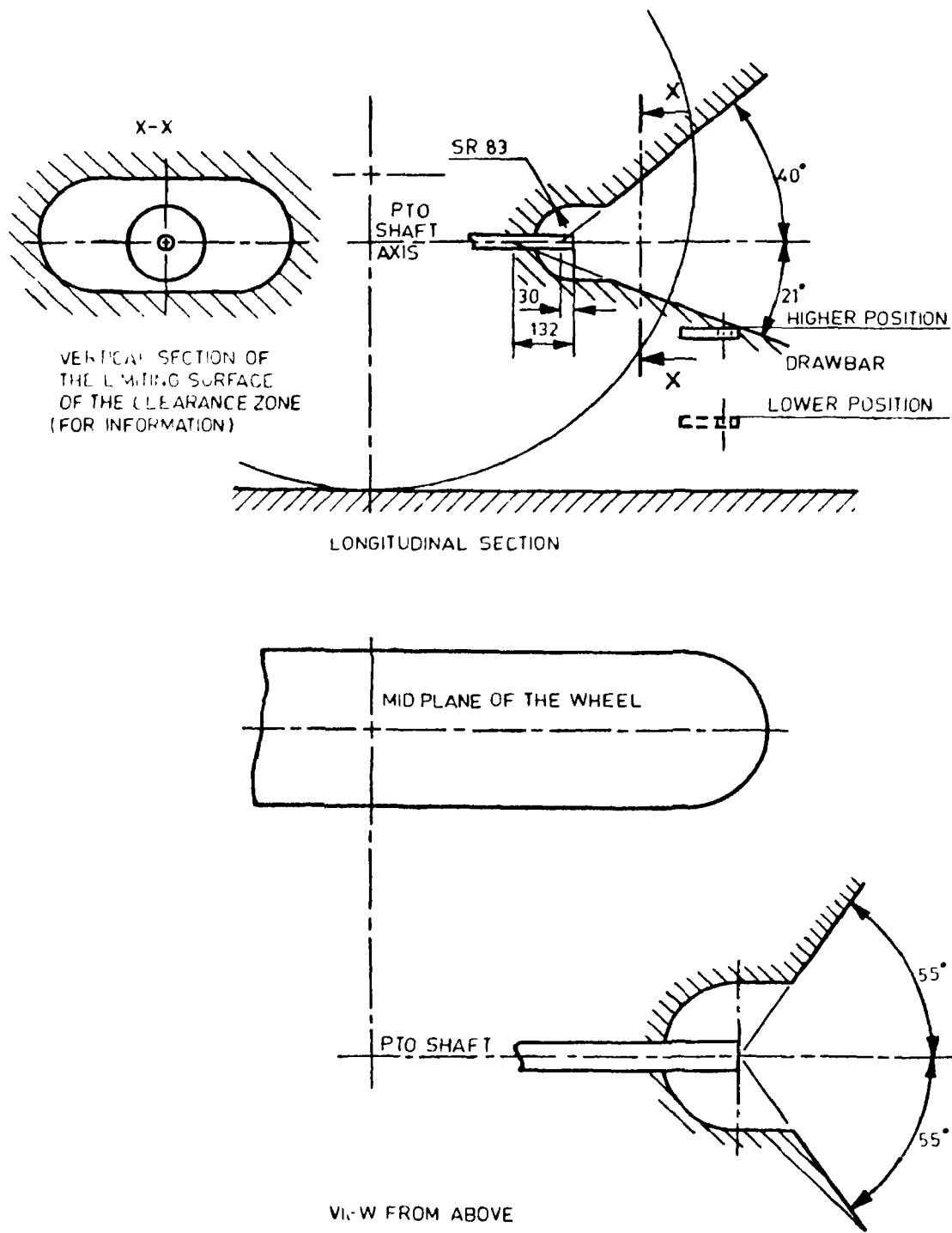


FIG. 4 LOCATION OF PTO



¹⁾ May be restricted by movable and/or detachable devices. The clearance zone for towed implements shall be in accordance with IS 12362

FIG. 5 CLEARANCE ZONE AROUND PTO



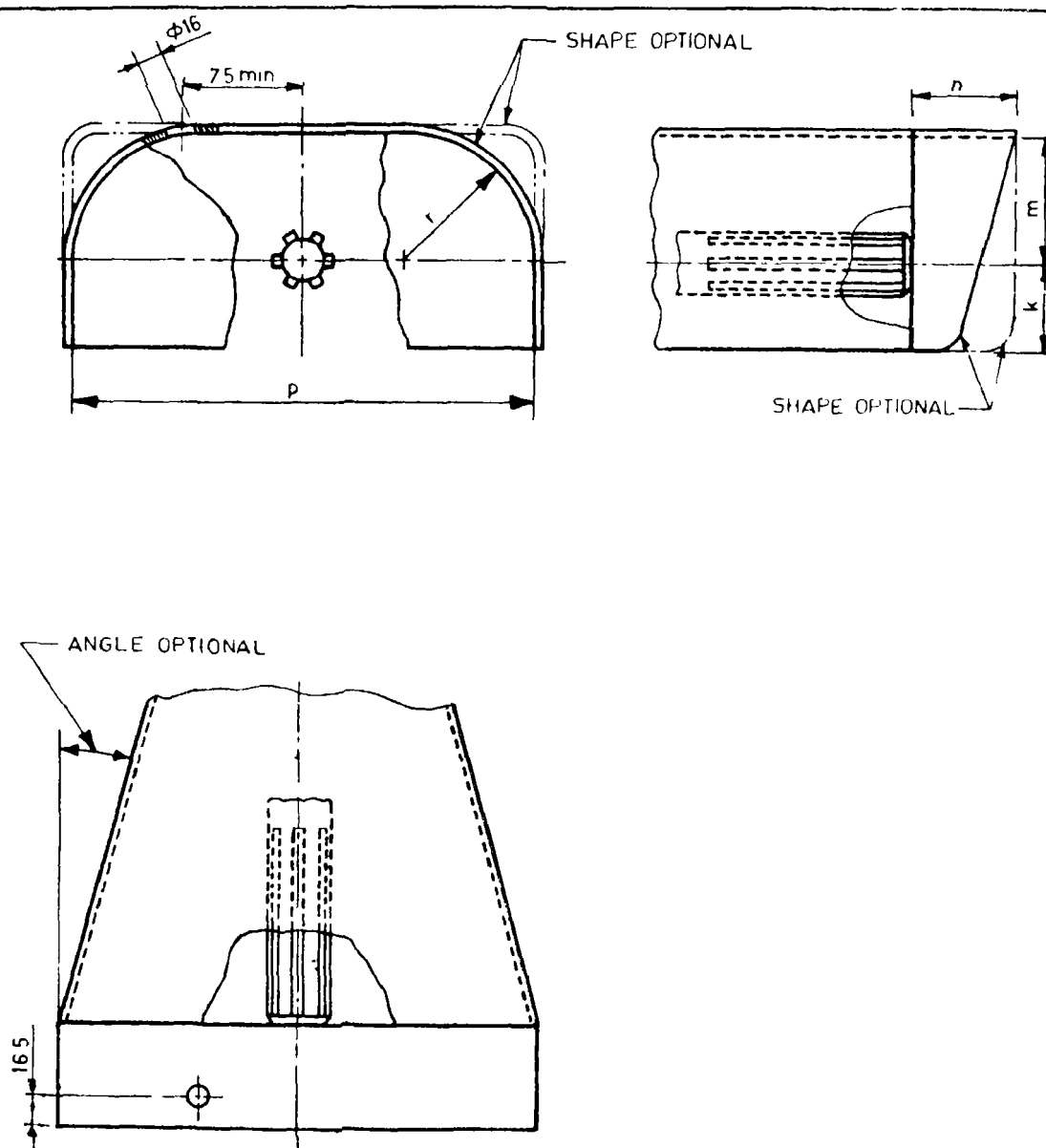
VI-W FROM ABOVE
All dimensions in millimetres
FIG. 6 CLEARANCE ZONE AROUND PTO

Table 6 Dimensions of Clearance Zone
(Clause 4.4)

All dimensions in millimeters

PTO Type	<i>a</i> Min	<i>b</i> Max	<i>c</i> Max	<i>g</i> Min	<i>i</i> Min	<i>r</i> Max	<i>z</i> Min
1	76	80	60	240 ¹⁾	280 ¹⁾	76	55°
2							
3	89	100	65	290	295	289	51

¹⁾ On tractors with a minimum track setting of 1150 mm or less and/or tractors equipped with special hitch devices, for PTO Types 1 and 2 dimensions *g* and *i* may be reduced to 210 mm



NOTE — The shape of the shield may differ where not defined provided it gives equivalent protection and does not infringe upon the clearance zone.

All dimensions in millimetres.

FIG. 7 MASTER SHIELD OF PTO

Table 7 Dimensions of PTO Master Shield

(Clause 4.5.1)

All dimensions in millimeters

PTO Type	<i>k</i> Min	<i>m</i> + 5 (see Notes 1 and 2)	<i>n</i> + 5	<i>p</i> ± 5 (see Notes 1 and 2)	<i>r</i> Max
1 2	70	125	85	285	76
3	80	150	100	355	89

NOTES

1 On tractors with two rear PTO shafts, the dimensions *m* and/or *p* may need adjustment to maintain equivalent clearances between shift and shield

2 On tractors with a minimum track setting 1150 mm or less and/or tractors equipped with special hitch devices, for PTO Types 1 and 2, dimension *m* may be reduced to 110 mm and dimension *p* to 215 mm

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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